REMARKS

Paragraph [0053] of the specification has been amended for clarification.

Claim 1 has been amended to define the dye-sensitized solar cell as comprising a first substrate having a light-transmitting property; a laminate unit stacked on the first substrate (as defined in claim 1); and an electrolyte material incorporated in the semiconductor electrode, the first collector electrode and the insulating layer. Support is found, for example, by reference to Fig. 1 and paragraph [0034] at page 10 of the specification. Claim 1 has also been amended to recite that a first surface of the semiconductor electrode comes in contact with the first substrate. Support is found, for example, in Figure 1 of the specification.

Claim 4 has been amended to recite that the first collector electrode has a porosity of 2 to 40%. Support is found, for example, in paragraph [0024] at page 7 of the specification.

New claims 8-13 have been added.

Support for claim 8 is found, for example, in paragraph [0025] at page 7 of the specification.

Support for claim 9 is found, for example, in Figure 9 of the specification.

Claims 10 and 11 correspond to claims 4 as amended and claim 5, respectively, but depend from claim 9.

Support for claims 12 and 13 is found, for example, in the Examples of the specification.

No new matter has been added, and entry of the Amendment is respectfully requested.

Upon entry of the Amendment, claims 1-13 will be pending.

Claims 1 and 3-5 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Application Publication No. US 2003/0013008 to Ono.

Applicants submit that this rejection should be withdrawn because Ono does not disclose or render obvious the presently claimed dye-sensitized solar cell.

Ono teaches a light-receiving device provided with a transparent substrate 100, a semiconductor electrode 20 (200), an ion conductive electrolyte layer 30 and a counter electrode 400. One example of the light-receiving device of Ono has transparent substrates 100, dye-sensitized semiconductor layers 220a, 220b and 220c and conductive layers 210 as shown in Figure 13 of Ono.

The Examiner refers to Figure 13 of Ono, and asserts that green-photosensitive layer (220b) is a semiconductor electrode containing a sensitizing dye as recited in present claim 1, transparent electrically conductive layer (mid 210 adjacent to 220b) is a first collector electrode as recited in claim 1, transparent substrate (middle 100) is an insulating layer as recited in claim 1 and common counter electrode (400) is a catalytic electrode layer as recited in claim 1.

Each of the conductive layers 210 in Ono is made of a transparent electrically conductive film of tin oxide, indium-tin oxide, etc., in order to secure sufficient transparency for the photosensitive semiconductor layer 220 and to allow for photoelectric conversion. See paragraph [0166] of Ono. The arrangement of such transparent conductive films 210 on the light incident sides of the semiconductor layers 220 results in low photoelectric conversion efficiency as discussed in paragraph [0004] of the present specification. In particular, it is difficult or impossible to decrease the internal resistance of the device to a sufficient level by the use of the transparent conductive films 210.

Further, Ono teaches the use of a metal lead 11 to reduce the resistance of the transparent conductive layer 10 or the counter electrode 40 as shown in Figs. 4 and 5. However, Ono does not teach that the metal wire 11 is arranged in a specific pattern.

In contrast, in the present invention, the first collector electrode is arranged on the second surface of the semiconductor electrode rather than the first surface (light incident side) of the semiconductor electrode. The first collector electrode need not secure a light transmitting property. This makes it possible to lower the resistance of the first collector electrode and, by extension, the internal resistance of the dye-sensitized solar cell by, e.g., forming the collector electrode from metal. This also makes it possible to irradiate a large amount of light on the semiconductor electrode, without the light amount being reduced by the collector electrode. The dye-sensitized solar cell of the present invention is thus able to achieve improved photoelectric conversion efficiency. In view of the above-noted difference in structure, and for this reason alone, it is respectfully submitted that the amended claims define novel subject matter and are patentable over Ono.

Further, the dye-sensitized solar cell of the present invention is able to allow distribution of the electrolyte material between the semiconductor electrode and the catalytic electrode layer for sufficient ion migration when the first collector electrode is formed into a porous layer with a porosity of 2 to 40% or arranged in a grid pattern, comb pattern or radial pattern. Thus, it is respectfully submitted that amended claim 4 is separately patentable from claim 1.

In addition, the dye-sensitized solar cell of the present invention is manufactured by previously producing the laminate unit in which the semiconductor electrode, the first collector electrode, the insulating layer, the catalytic electrode layer and the second substrate are arranged in order of mention as mentioned in, for example, paragraphs [0034], [0060] and [0061] of the specification (without forming the collector electrode on the semiconductor electrode), and then, stacking the thus-obtained laminate unit onto the first substrate. This difference in structure is

reflected in amended claim 1 which defines the solar cell as comprising a first substrate having a light-transmitting property, and a laminate unit stacked on the first substrate.

For example, in the case of the second substrate being of ceramic and the first collector electrode being of high-melting corrosion-resistant material such as tungsten, the collector electrode can be applied by paste printing and sintered in a reducing atmosphere before forming the semiconductor electrode. This makes it possible to attain ease of manufacturing the dye-sensitized solar cell while maintaining the configuration, form and function of the collector electrode, the semiconductor electrode and the substrate so as to, for example, provide the collector electrode with some thickness for sufficiently low resistance.

Ono does not teach or suggest the above-noted differences in structure and characteristic features of the present invention. Accordingly, reconsideration and withdrawal of the § 102(b) rejection of claims 1 and 3-5 based on Ono are respectfully requested.

Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Ono in view of U.S. Patent No. 6,291,763 to Nakamura.

This rejection should be withdrawn for essentially the same reasons that the previous § 102(b) rejection of claims 1 and 3-5 based on Ono should be withdrawn as discussed above. Nakamura was cited as teaching dye-sensitized solar cell built on a metallic or ceramic supporting substrate. See col. 30, lines 23-28. Nakamura does not make up for the deficiencies of Ono.

Claims 6-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ono.

This rejection should be withdrawn for essentially the same reasons that the previous § 102(b) rejection of claims 1 and 3-5 based on Ono should be withdrawn as discussed above.

Claims 8-13 are patentable over Ono and Nakamura for at least the same reasons that claims 1-7 are patentable over Ono and Nakamura as discussed above.

Allowance is respectfully requested. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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Respectfully submitted,

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